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Subbase for feeding and supporting control valves.

A subbase (1) comprising sectional distributing units (3) for supporting and feeding compressed air to control valves (2) respectively to utilizing apparatuses. Each distributing unit (3) is provided with a main duct (7) between lateral surfaces (10) defining the interfaces of adjacent distributing units (3), and connecting means for firmly and tightly securing two or more distributing units (3) together; the connecting means comprise, in correspondence with the aforesaid interfaces (10), pivot means (14, 15) situated on one side of the main duct (7), and at least one locking member (16) on the opposite side, said locking member (16) acting to exert a coupling force between interfaces of adjacent distributing units (3) which slopes towards and forms an angle with the longitudinal axis of the main duct (7).

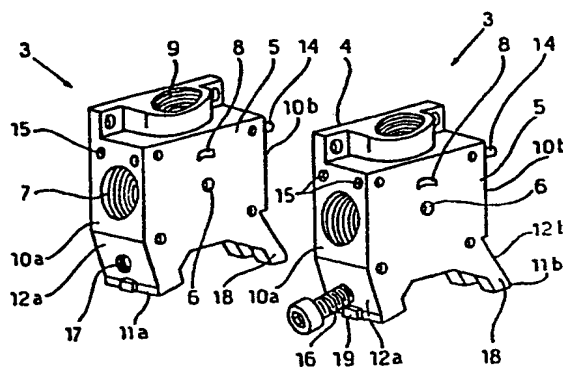


Fig. 2

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Subbase for feeding and supporting control valves

This invention concerns a compressed-air distributing device and in particular a subbase with sectional modular elements for feeding and supporting pneumatic or solenoid control valves for apparatuses utilizing compressed air.

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As is known, in pneumatic control circuits for power-consuming machines or for apparatuses utilizing compressed air, it is the usual procedure to install two or more valves on a subbase for supporting and distributing the air, so as to supply compressed air to two or more utilizing units by means of a common feeding source. The subbases are currently made in one piece from a metal bar which is suitably drilled and machined in order to form a main feeding duct, the passages for the compressed air in correspondence with the points of assembling the various valves, and branched-off ducts for connecting to the various apparatus. Since the number of valves which can be used simultaneously varies from plant to plant, the manufacturers are forced to prepare and to store a large quantity and selection of subbases, resulting in considerably high management costs and capital expenditure. Furthermore, these types of subbases are characterized by their extremely poor versatility, in that they can very rarely be adapted to meet all the requirements of the users.

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In an attempt to remedy these problems, subbases with modular sectional elements have also been proposed, in which two or more distributing elements are connected in series in order to form a subbase with any given number of seat-

ings for valves relative to any given number of utilizing
apparatuses. Even though the sectional subbases currently
in use fulfill the purpose for which they were designed,
there still remains the problem of their structural simpli-
5 fication and matchability, in addition to the problem of
a satisfactory liquid seal.

To date, the mechanical and pneumatic coupling of the va-
rious distributing elements in a subbase, has been achie-
10 ved by means of particularly complicated systems which do
not give total freedom from the problems of fitting and,
consequently of operating the various valves, and from
those of the various distributing units of a subbase.

15 A scope of this invention is therefore to provide a modu-
lar sectional distributing unit for forming subbases for
distributing compressed air and for supporting control
valves, which is provided with an extremely simple but at
the same time extremely efficient connecting system, cap-
20 able that is, of ensuring a satisfactory airtight seal
between adjacent distributing units, and which is also
suitable for use in pneumatic circuits operating at rela-
tively high pressures, equal to or over ten Bars.

25 A further scope of this invention is to provide a subbase
with sectional distributing units, as specified above, in
which the individual distributors are provided with simple
coupling means to permit a rapid assembly and which en-
sures the utmost rigidity and stability of the assembled
30 subbase.

All this has been made possible by means of a subbase made up of sectional distributing units for supporting and feeding compressed air to control valves, respectively to utilizing apparatuses, in which each distributing unit is provided with a main duct arranged along the longitudinal axis of the subbase, between lateral surfaces defining the interfaces of adjacent distributing units, and connecting means for firmly and tightly securing two or more distributing units together, characterized by the fact that the connecting means comprise, in correspondence with the aforesaid interfaces, pivot means situated on one side of the main duct, and at least one locking member on the opposite side of the aforesaid duct, said locking member acting in order to exert a clamping force between the interfaces of adjacent distributing units, which force slopes towards and forms an angle with the longitudinal axis of the main duct.

According to a preferred embodiment, the pivot means between adjacent units are in the form of simple pins on one of the interfaces, which fit into appropriate seats on the corresponding interface of an adjacent distributing unit, whilst the locking member consists of a simple slanting screw, capable of exerting a thrust action in the direction of the hinge pins and at the same time of shifting the point of application of the clamping force as close as possible to the main duct axis, thereby permitting a better fluid seal.

According to a further feature of the distributing units

- for subbases, according to this invention, each lateral interface between adjacent distributing units presents a first flat surface portion arranged on a plane at right angles to the axis of the main duct in correspondence with the pivot pins, and a second flat surface portion, parallel to and spaced apart from the first surface portion, arranged at the end of an intermediate sloping portion, in correspondence with which is situated the locking member.
- 10 These and further features of the subbase with sectional distributing units, according to this invention, will ensue from the following description, with reference to the figures in the accompanying drawings, in which:
- Fig. 1 shows a front view of a sectional unit subbase, fitted with valves;
- 15 Fig. 2 shows a perspective view of two distributing units according to a particular embodiment;
- Figs. 3 and 4 show side views of a distributing unit, in correspondence with the interfaces of adjacent units;
- 20 Fig. 5 shows a partially sectional plan view of two adjoining distributing units;
- Figs. 6 and 7 show enlarged details of fig. 5, of the distributing units before and after the assembling.
- 25 Figure 1 shows a generic subbase 1 for supporting and feeding air to a number of apparatuses or devices utilizing compressed air, more generically referred to as "utilizers", through pilot valves or solenoid valves 2, only a few of which have been shown.

The subbase 1 is therefore made up of modular sectional distributing units 3, equal in number to the valves to be fed, the overall structure of which is shown in the remaining figures.

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In particular, each distributing unit is delimited on two sides by surfaces or portions of flat surfaces defining, with reference to the figures, a lower face 4 for anchoring to the subbase 1, and an upper face 5 supporting the valves 2, provided with a central aperture 6 permitting communication between the inlet of a valve 2 and respectively, a main duct 7 of the distributing unit. A second aperture 8 for the flow of compressed air, on the aforesaid upper face 5, connects the valve 2 to a branched-off duct 9 connected to the utilizer.

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Each distributing unit 3 is moreover delimited, on the two interfaces of adjacent units, by flat surfaces or surface portions lying in planes parallel to each other and at right angles to the longitudinal axis of the main duct 7 which is tightly connected to the main ducts of the following or preceding units and co-operates in defining the entire air-distribution duct in a subbase made in this way.

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As can be seen from the figures, each of the interfaces of the distributing units comprises a first flat surface portion 10a and 10b on which open out the ends of the main duct 7, and a second flat surface portion 11a and 11b, arranged parallelly to and at a certain distance from the first ones, at the end of a sloping surface portion, 12a

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and respectively 12b, for the purposes pointed out further on. A gasket 13 is situated in an appropriate seating on the surface 10b, to form an air seal in correspondence with the main duct 7.

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Each distributing unit 3 is completed by interconnecting means in order to permit quick and easy assembling and disassembling of the individual distributing units, with or without the valves assembled. The aforesaid interconnecting means substantially comprise pivot means situated on one side of the main duct, which in the case of the example shown, consist of a pair of pins 14 on the surface 10b, protruding parallel to the axis of the main duct 7, which pins fit into a corresponding pair of holes or seats 15 on the surface 10a of the adjoining distributing unit, as shown schematically in figures 5 and 7.

The aforesaid interconnecting means comprise, moreover, a clamping member situated on the side of the duct 7 opposite that of the centering and pivot means 14; such locking member may be made in any way as long as it is able to provide a clamping force which is inclined with respect to the longitudinal axis of the main duct 7 of the distributing unit, that is to say, to create a crosswise force between one unit and the other, having its action point as close as possible to the longitudinal axis of the duct 7.

In the specific case, the locking member is in the form of a screw 16 which screws into a threaded hole 17 in the sloping surface 12a of each unit, so that its axis forms

an angle ranging between approximately 12 and 18 degrees with the axis of the duct 7; the screw 16 lies on an intermediate plane between the hinge pins 14 and comprising the axis of the duct itself, so as to create an even
5 distribution of the clamping pressures on the interfaces. The fastening screw 16 engages with a fork-shaped part 18 on the opposite side of an adjacent unit, positioning the head of the screw to the rear of the arms of the fork 18. A tooth or protrusion 19 beneath the screw hole 17 comes
10 to rest between the arms of the fork 18 and co-operates with the pins 14 to ensure that the various distributing units are and remain firmly secured and complanate to each other.

15 The various distributing units 3 are assembled together to form a subbase of any desired length, in the following way: with reference to the example in the accompanying drawings, as shown in figures 2 and 6, two adjacent distributing units are placed close together and the fork
20 -shaped end 18 of one unit is fitted onto the screw 16 of the other by making them slide reciprocally along the interfaces 10, 10b until the pins 14 of the first unit are aligned with the holes 15 of the other unit. At this point, the pins 14 are inserted into the corresponding
25 holes, bringing the gasket 13 gently into contact with the peripheral edge of the main duct 7 of the adjoining distributing unit and making the opposing faces 10a and 10b of the two units touch in the area of the centering and pivot pins. The faces 11a and 11b on the opposite
30 side are not yet perfectly in contact with each other,

consequently an adequate lever arm is formed between the fastening screw 16 and the pivot pins 14, thus enabling the correct airtight clamping of the units. In fact, due to the sloping disposition of the fastening screw 16, with
5 respect to the axis of the duct 7, the tightening force of the screw is distributed in two directions at right angles to each other, one of which parallel to and lying in the plane of the two interfaces 10a and 10b and the other parallel to the duct 7. The first of these two forces
10 will tend to shift the two units 3 sideways, one with respect to the other, forcing the pins 14 against the sides of the respective seats 15 and creating a sufficient frictional force to give the desired hinge-effect along an axis at right angles to the duct 7, that is to say, a
15 sufficient degree of friction to prevent the pins from sliding out, whilst the other of the two component forces will act on the lever arm in the sense of pressing one distributing unit against the other, drawing the two interfaces close together until the faces 11a and 11b touch
20 each other. The correct tightening of the fastening screw 16 and the lever and hinge effect thus achieved, as well as the correct positioning of the two units achieved by means of the fiducial planes 10a, 10b and 11a, 11b, make it possible to tighten the gasket 13 with an adequate
25 sealing pressure. From tests carried out, it was observed that even at 10 Bars, that is to say, at the maximum operating pressure currently used for pneumatic systems, the locking system guarantees the necessary seal; however, the tests were continued until they reached fluid pressures
30 of over 30 Bars, without any losses or problems

occurring.

The locking system clearly offers numerous advantages in subbases of the aforementioned type, thanks to the particular sloping disposition of the clamping force exerted by the screw 16 or by any other suitable device, in that this inclination makes it possible to create a point of articulation, even by means of simple axial pins, and at the same time bringing the point of application of the force close to the fluid duct, that is to say, in the area where the seal is of the utmost importance; moreover, apart from permitting its easy insertion into the fork-shaped end of the adjacent unit, the sloping disposition of the screw also offers operational simplicity by making use of a simple screwdriver which can be easily operated from one side without interfering with the individual units of the subbase.

It is understood therefore that, on the basis of the principles set forth herein, other solutions or dispositions of the locking and hinging elements are possible, without however deviating from what is claimed hereunder.

Claims

1. Subbase comprising sectional distributing units (3) for supporting and feeding compressed air to control valves (2) respectively to utilizing apparatuses, in which each distributing unit (3) is provided with a main duct (7) arranged along the longitudinal axis of the subbase (1) between lateral surfaces (10) defining the interfaces of adjacent distributing units (3); and connecting means for firmly and tightly securing two or more distributing units together, characterized by the fact that the connecting means comprise, in correspondence with the aforesaid interfaces (10), pivot means (14, 15) situated on one side of the main duct (7), and at least one locking member on the opposite side of the aforesaid main duct (7), said locking member (16) acting to exert a coupling force between the interfaces of adjacent distributing units, said face sloping towards and forming an angle with the longitudinal axis of the main duct (7).
2. Subbase as claimed in claim 1, characterized by the fact that the pivot means (14, 15) are defined by pins (14) and by respective seats (15), on the interfaces of adjacent distributing units (3).
3. Subbase as claimed in claim 2, characterized by the fact that said pins (14) and the relative seats (15) are orientated parallelly to the axis of the main duct (7).
4. Subbase as claimed in claim 1, characterized by the

fact that said locking member consists of a screw (16) whose axis forms an angle with and crosses the axis of the main duct (7) of the distributing units (3).

5 5. Subbase as claimed in claims 1 and 4, characterized by the fact that each distributing unit (3) comprises, on the side opposite that of the fastening screw (16), a fork-shaped part (18) which engages with the fastening screw (16) of an adjacent distributing unit (3).

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6. Subbase as claimed in claim 1, characterized by the fact that, in correspondence with the interfaces (10), each distributing unit (3) comprises a first flat surface portion (10a, 10b) in correspondence with the pivot means (14, 15), and a second flat surface portion (11a, 11b) in
15 correspondence with the clamping member (16), said flat surface portions (10a, 10b; 11a, 11b) being arranged at right angles to the axis of the main duct (7) and spaced apart in the direction of the axis itself.

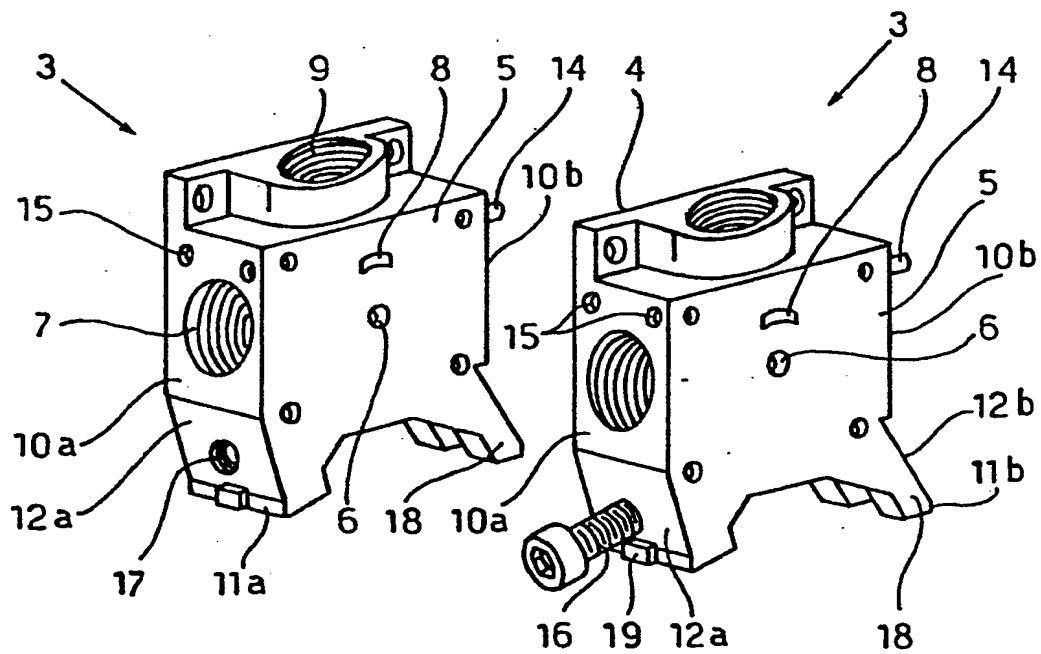
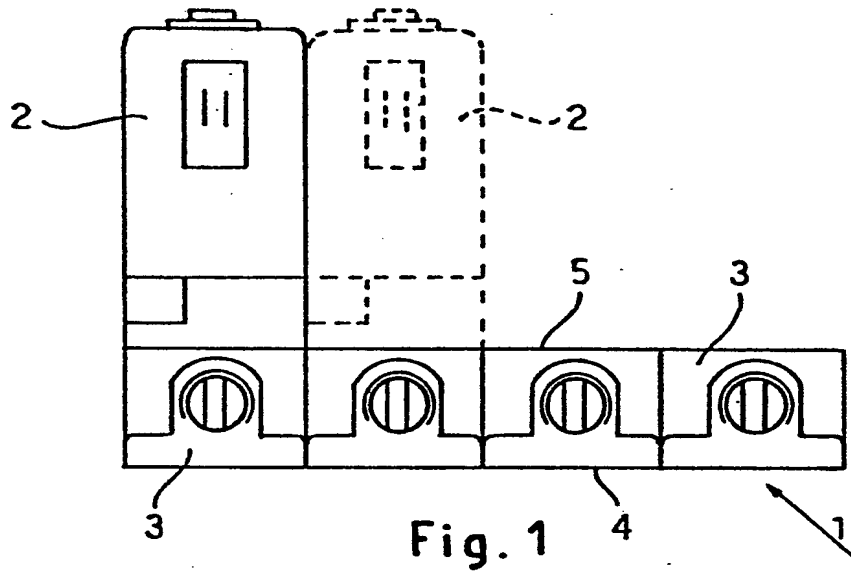
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7. Subbase as claimed in claims 5 and 6, characterized by the fact that said flat surface portion (11b) in correspondence with the clamping member (16) is situated at the ends of the arms of the fork-shaped portion (18) of
25 each distributing unit (3).

8. Subbase as claimed in claim 1, characterized by the fact that said clamping member (16) exerts a force lying in a plane at right angles to the axis of articulation
30 between the units (3) and comprising the axis of the main

duct (7) of the units themselves.

9. Subbase as claimed in claims 6 and 7, characterized by the fact that each distributing unit (3) comprises, on the
5 side opposite that of the fork-shaped portion (18), and in correspondence with the relative flat surface portion (11a), a centering protrusion (19) which fits between the arms of the aforesaid fork-shaped portion (18).



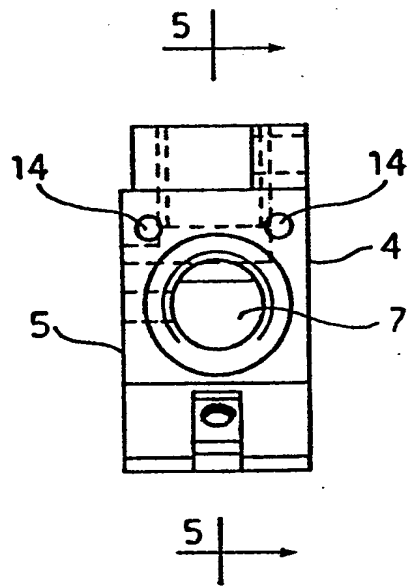


Fig. 3

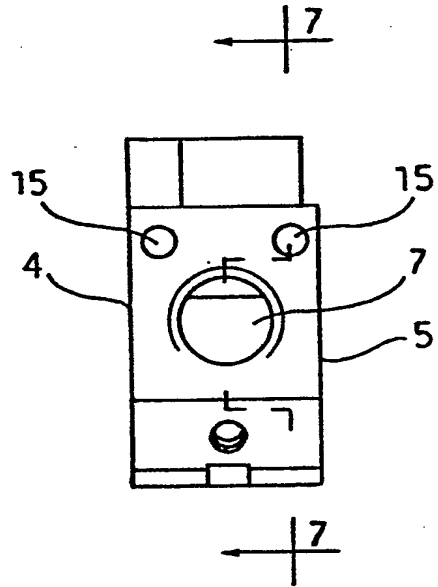


Fig. 4

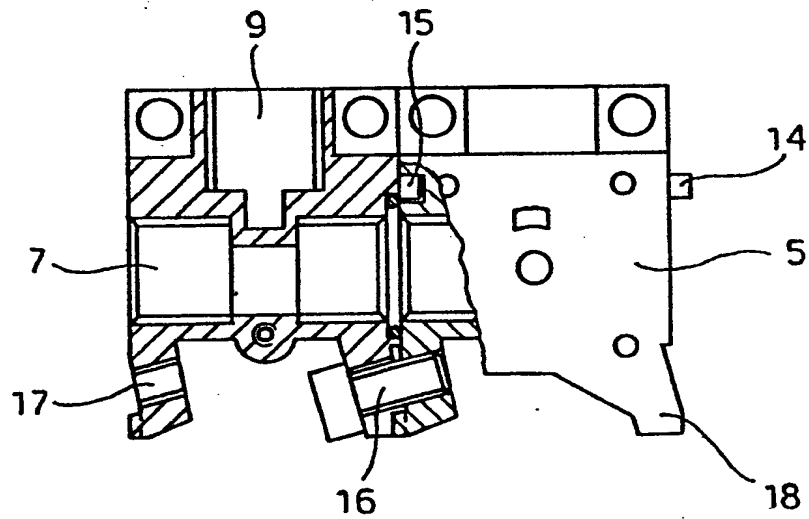


Fig. 5

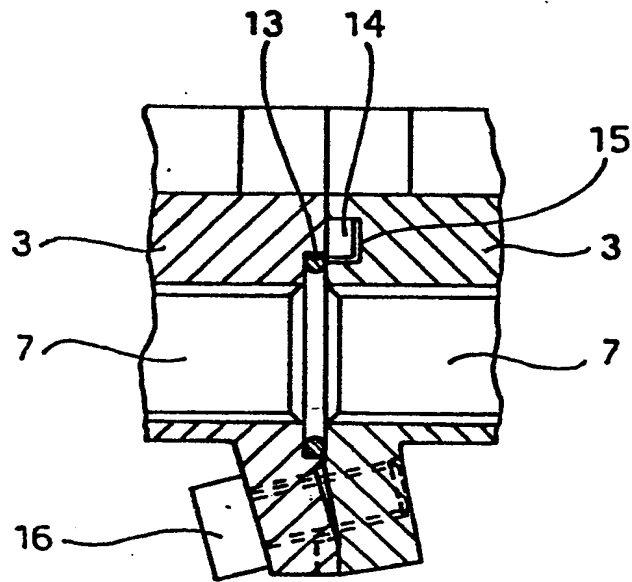


Fig. 7

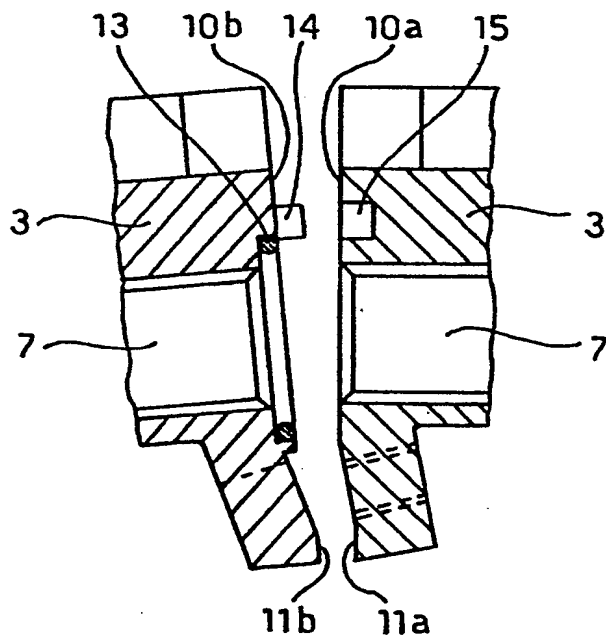


Fig. 6



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EUROPEAN SEARCH REPORT

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. 4)
X	US-A-4 051 861 (ELLISON) * Column 2, line 56 - column 4, line 39 * -----	1-5	F 15 B 13/00
			TECHNICAL FIELDS SEARCHED (Int. Cl. 4)
			F 15 B
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 29-10-1985	Examiner KNOPS J.
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